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Middle Articles

Circumstances of Accidental Poisoning in Childhood

R. H. JACKSON,* M.C., M.A., B.M., B.CH., M.R.C.P.; J. H. WALKER,† M.D., D.P.H. N. A. WYNNE, # M.B., B.S., M.P.S.

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Summary: Of 377 children with accidental poisoning, the commonest ages were 1, 2, and 3. The most important contributory factor was that the poison was kept in an inappropriate place. Most containers were closed, but the children found them easy to open. In some cases the container itself was unsuitable for the contents.

The frequency of poisoning in childhood might be reduced in six main ways: (1) a reduction in the quantity of drugs kept in the home; (2) the provision of drug cupboards; (3) the provision of containers that are difficult for children to open, or individually foil-wrapping tablets; (4) making tablets less attractive to children; (5) clear identification of potential poisons; and (6) increasing parental awareness of the circumstances under which poisoning occurs.

A plea is made for further sociomedical research into the prevention of poisoning.

Introduction

In this country the incidence of accidental poisoning in children is slowly rising. As with other types of accidents, it should be possible to reduce this incidence by the institution of appropriate preventive measures. This paper reports on the important factors found to be involved in this problem, and in the light of these findings suggests six possible ways of reducing the incidence of this type of poisoning.

The number of deaths in children caused by accidental poisoning appears to be relatively small. In 1966 there were 1,300 accidental deaths under the age of 15 in England and Wales, and 183 of these were due to poisoning (Table I), 108 being caused by the inhalation of household and other gases and the remaining 75 by the ingestion of solids or fluids.

TABLE I.—Admissions to Hospital and Deaths from Poisoning (England

	Children	Adults	Total	_
Total deaths	183 13,270	5,512 37,130	5,695 50,400	

While mortality therefore appears to be comparatively low, morbidity and the sequelae of poisoning are thought to be considerable. Unfortunately, little is known of the true incidence of poisoning, and even less of the remote results, since this is a syndrome for which complete figures do not exist. Some patients may not even seek medical help, some may be dealt with by their family doctor, and of those who do come to hospital many return home after treatment in the casualty department. No series of figures are available for the first two categories, and no national figures for casualty department attendances exist; for while the Platt Report on accident and emergency services gave figures for one week's attendances, poisonings were not individually identified. Admissions to hospital provide one numerical indicator, and the 10% sample of the hospital inpatient inquiry showed that in 1964 13,270 children and 37,130 adults entered hospital as a result of poisoning. This ratio of child to adult admissions of 1 to 3 is mirrored in local figures: approximately 80 children and 250 adults are admitted to the Royal Victoria Infirmary, Newcastle upon Tyne, each year. There may be regional variations: in Cardiff, for instance, children form a much higher proportion of the admissions due to poisoning, 732 of the 942 patients admitted in 1950-65 being children (Graham and Hitchens, 1968).

The first annual report of the National Poisons Information Service indicated that there were twice as many inquiries about poisoning in children as there were about adults (Goulding and Watkin, 1965). The Newcastle Regional Poisons Information Centre receives three times as many inquiries concerning children as adults. The British Medical Association's (1964) survey indicated that four-fifths of all poisoning episodes in the home involved children aged 1 to 3 years. picture is that, compared with adults, large numbers of children are poisoned, a small proportion require admission to hospital, and relatively few of them die. Poisoning in adults is usually more serious and the death rate is much higher. This difference almost certainly reflects their different causes: the child is poisoned because of his lack of experience, his inquisitiveness, and his inability to understand the consequences of his actions. The adult is poisoned either deliberately, as in "self-poisoning," or by a genuinely unforeseeable accident. The conclusion to be drawn is that poisoning in childhood is a distinct clinical and social entity and requires special epidemiological consideration.

Present Series

With a view to preventive action we have investigated the circumstances under which a group of children were poisoned. A preliminary study was carried out locally by Carter and Wilkinson (1966), who during the autumn of 1965 visited the homes of 37 children referred to hospital because of poisoning. An important conclusion of their study was that the majority of poisoned children had sensible mothers who showed neither serious lack of thought nor feckless irresponsibility. While this pilot study involved two Tyneside hospitals only, the main study was extended to include all those children seen in the

^{*} Consultant Paediatrician, Royal Victoria Infirmary, Newcastle upon Tyne, and the Gateshead Group of Hospitals.
† Senior Lecturer, Department of Public Health, University of Newcastle

upon Tyne.

‡ Consultant Toxicologist, Poisons Information Centre, Royal Victoria Infirmary, Newcastle upon Tyne; Senior Lecturer, Department of Pharmacology, University of Newcastle upon Tyne.

accident and emergency departments and those admitted direct to the wards of the Royal Victoria Infirmary, Newcastle upon Tyne, the Newcastle General Hospital, and the Queen Elizabeth Hospital, Gateshead, during 1966.

26 October 1968

Age and Sex Distribution.—The total number of children involved was 377 (194 boys and 183 girls). Their age distribution (Table II) shows that the majority were toddlers, two-thirds being aged 1 to 3. A small secondary peak in early adolescence is discussed below. Of the 377 children, 144 (38%) were admitted to hospital and 233 were outpatients. There were no deaths.

TABLE II.—Age and Sex Distribution of 377 Poisoned Children

	-						Ag	e in `	Years								
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Boys Girls	3 8	42 35	78 71	32 24	10 12	6 4	4	1 2	3 1	3	1 2	2 0	2 2	2 8	0 5	4 6	1
Total	11	77	149	56	22	10	5	3	4	4	3	2	4	10	5	10	2

Place in Family.—Carter and Wilkinson (1966) suggested that "only" children were less likely to be poisoned than those with brothers and sisters, and data from our survey support this. "Only" children comprised 19% of the survey children (47 out of the 253 for whom the information was available) compared with 37% of children in the general population. The most reasonable explanation for the lower proportion of poisoning in "only" children is that mothers are better able to supervise them.

Social Class.—Examination of the social class of the family (Table III) shows that classes I and II are by no means immune; indeed, it is possible that doctors' children in particular are at risk because free samples of drugs, some unsolicited, enter the house by post.

TABLE III.—Social Class Distribution

	Social Class							
	I	II	III	IV	v	N.C.		
Poisoned children (%) Local population (%)	6·2 3·2	9·1 11	54·1 55	10·2 18	17·0 12	3.5		

Type and Place of Container

In considering the circumstances under which children were poisoned three aspects emerged as being of obvious importance: (1) the type of container holding the substance taken by the child; (2) whether the container was open or closed; and (3) whether the container was in an appropriate place. Admittedly an estimate of whether the container was in an appropriate place is bound to be subjective, and in assessing this we have taken into account the fact that parents of toddlers should recognize that the child will sample any substance provided that he can get at it. In a childless household it might be considered appropriate to store paraffin or turpentine under the kitchen sink, but in a household with a toddler this would be an inappropriate place. Similarly, digoxin tablets in an envelope in mother's handbag would be regarded as an inappropriate container in an inappropriate place. Generally speaking, we had no great difficulty in deciding these points when the information was recorded (Table IV).

TABLE IV.—Type and Place of Container

Type		Cover		Site	
Appropriate Inappropriate Not applicable Unknown Not recorded	204 27 19 12 115	Open	41 176 19 12 129	Appropriate Inappropriate Not applicable Unknown Not recorded	 49 170 15 13 130

On the whole the substances were stored in proper containers, but 1 in 8 were in inappropriate containers and in many instances this led to the poisoning. The commonest type of change of container involved putting domestic fluids in "pop" bottles; we had examples of paraffin, petrol, and turpentine stored in such bottles. This danger was highlighted by the tragic death of a 15-year-old boy (in spite of a lung transplant) as the result of drinking weed-killer which had been put in a "pop" bottle (Matthew et al., 1968). We ourselves have recently had a boy (not included in this series) who developed a complete pyloric stricture as a result of drinking sulphuric acid put in a "pop" bottle by his father.

In approximately one-fifth of the cases in which the information was available the container was open, but it is interesting to note that in the four-fifths of the cases in which the container was closed the child had no insuperable difficulty in opening it. In one case the container was said to have a safety top.

The most significant finding in the whole of our survey concerns the place where the container was kept when the child got hold of it. In no less than four-fifths of all recorded cases we judged the container to have been in an inappropriate place, and thus more accessible to the child than it should have been. Tablets were kept on top of television sets or on the mantelpiece, and many were stored in drawers in the kitchen or living-room along with other household objects; kitchen cupboards were also favourite places as well as bathroom window-sills, bedroom dressing-tables, and bedside tables. Domestic fluids were kept in easily accessible places in the kitchen, larder, bathroom, or toilet.

In some cases the parents had been aware of the potential dangers of the medicines and had kept them in what would normally be regarded as a safe place. One child put a chair on top of a table in order to get a bottle from the top of a wardrobe, and there were other examples of children climbing on furniture to reach things on high shelves. However, there is no doubt that in the majority of cases the parents or adults in charge of the child did not anticipate the dangers of leaving the drug in an accessible position.

Circumstances in which Poison was Taken

As might be expected, the majority of children (349 of the 364 concerning whom the information was recorded) who took drugs or other substances did so of their own accord, though 14 children were given them by others. In eight families two or more children shared the poison among them, and in six cases the drug was inadvertently given by an adult—four mothers and two grandparents. One grandmother gave a child camphorated oil by mouth instead of castor oil (one wonders what the therapeutic necessity is for either of these substances nowadays). The majority of children were alone and unsupervised at the time of taking the poison. This information was recorded for 262 of the 377 children involved: in 147 instances the child was alone, in 82 he was in the company of other children, and in 33 cases he was with adults.

Self-poisoning

Kessel (1965) has drawn attention to the large numbers of young adults and adolescents who take drugs deliberately as a means of escaping from, or drawing attention to, a difficult, uncertain, or unhappy situation. He prefers the term "self-poisoning" to "attempted suicide" for this type of poisoning. In our series 22 children (5 boys and 17 girls) came into this group in that psychological factors played a significant part in the aetiology. Eighteen warranted referral to the child psychiatry department for more expert help. The high proportion of girls reported by Kessel is confirmed by the present survey, though the numbers involved are small.

Substances Taken

It is not our purpose to describe at length the substances taken by the children, but they are briefly listed in Table V. The largest group is of pharmaceutical preparations (230 of the 377), with salicylates predominating. We did not record whether these were bought over the counter or supplied on prescription, but the majority of junior aspirins are likely to have been bought. The increasing use of psychotropic drugs is reflected by the fact that as a group they are taken more commonly than barbiturates. Slightly more girls than boys are poisoned by drugs, whereas the boys, possibly because of their greater inquisitiveness and adventurousness, tended to be attracted by domestic fluids and other substances. The range of domestic fluids and substances is very wide and varies from paraffin and alcohol to such oddities as a firework and Sherley's Swiftie Puppy-Trainer. This variety is a tribute to the growing child's desire to learn about his environment at a time when he has not yet outgrown the oral stage of his development and has not yet developed a sense of discrimination in taste. In turn it accounts for the fact that requests for information to the Newcastle Poisons Information Centre about the composition of household substances relate five times as often to children as to adults.

TABLE V.—Substances Taken

				Boys	Girls	Total
Pharmaceutical preparations Including: Salicylates Junior asp Adult aspi	irin 7		••	105	125	230
Barbiturates Tranquillizers, etc. Home remedies Domestic fluids Including:	:: ::	11 22 	••	11 52	4 36	15 88
Domestos	::	22 9 11 		17 9	9 9	26 18

Discussion

It is generally accepted that poisoning in adults is often the result of deliberate self-administration, whereas in childhood it is mainly accidental. While both are to some extent preventable, the problem in adults is essentially the early recognition of mental illness and the management of stressful social and emotional situations. Further measures which would help to reduce the incidence of poisoning in adults include the removal of poisonous constituents from substances in everyday use (particularly by a reduction in the content of carbon monoxide in household gases) and by diminishing the quantity of drugs lying about the house.

Our survey shows that the main factor in the poisoning of children is that the poisonous substances are too easily accessible to them. This conclusion was also reached by McKendrick (1960), who in a careful and detailed survey found that in 120 poisoning accidents in which the full facts were known about two-thirds could have been readily prevented, and that carelessness by adults in handling and storing materials and failure to appreciate the capabilities of the child were the most important contributing factors. "Nearly all the poisoning accidents occurred because the poison was too easily accessible to children."

The problem in children is therefore somewhat simpler than in adults, in that any measure designed to reduce the access of toddlers to poisonous substances will have an effect. There are six main ways by which this might be done:

(1) Quantity of Drugs.—A reduction in the quantity of drugs in the home can be achieved partly by continued watchfulness on the part of the family doctor and the health visitor or other nurse who may be visiting the home. Local cam-

paigns designed to encourage people to return unused drugs can also help, as a result of such a campaign conducted in the county borough of Hartlepool a total of 43,554 capsules and tablets were returned (Nicholson, 1967).

- (2) Drug Cupboards.—We know of no survey carried out in this country into the frequency with which special provision is made for the storage of medicines and other poisonous substances. In Sweden, where the standard of housing is high, Berfenstam and Beskow (1962) found that, whereas 98% of houses contained medicines or household chemicals, in only 10% was the storage safe and satisfactory and in only 8% was there a special medicine cupboard. Significantly, in those houses which had a special medicine container more than one-third of the families failed to use it properly.
- (3) Containers and Foil-Wrappings.—"Child-proof" containers and the foil-wrapping of individual tablets would both clearly reduce the numbers of tablets which children might take at any one time. Though a lot of research, particularly in America, has gone into the design of "child-proof" containers, no single design has proved entirely satisfactory. Goulding (1968) called for an increase in the use of strippacks, that is, individual tablet wrappings, but, commenting on this, Latham and Scherz (1968) quote American experience as favouring the child-resistant container.
- (4) Colour and Design of Tablets and Medicines.—The similarity in shape and colour between some drugs and certain types of sweets is well known (Lancet, 1956). As a result of a study of the attractiveness to children of different colours of sweets Jolly and Forrest (1958) suggested that all tablets should be white, but pointed out that doctors and patients alike would have to be educated to accept such tablets.
- (5) Labelling of Containers.—One difficulty faced by parents is to know which substances are harmful to children. No legislation exists which requires a manufacturer to state that a given product contains a poison, apart from those covered by the Poisons Acts (1933 et seq). If substances or products that are harmful in any way had this fact stated on the label of the container, together with the name of the poison concerned, two advantages would follow: (1) parents would know what to keep locked away and (2) the medical management of the poisoned child would be made much more efficient. The importance of the labelling of poisonous substances has been emphasized elsewhere (Brit. med. J., 1967, 1968; Wynne, 1968).
- (6) Education of Parents.—Very little money is spent in publicizing this problem on television, radio, or in the press, particularly when compared with the amount spent on advertising some of the substances with which children poison themselves. Much effective health education is carried out in child welfare clinics by health visitors, but unfortunately the most vulnerable section of the population, handicapped by social and intellectual inadequacy, is not likely to be influenced by any forms of propaganda. However, as we have shown that poisoning in childhood is widespread throughout the community, an increase in the public awareness of the problem could well result in a diminution in incidence.

Though all these six factors play a part in this problem, there is unfortunately little evidence on which to judge the relative efficacy of different preventive measures. So far as we can ascertain there has been no attempt to provide built-in medicine cupboards, child-resistant containers, or foil-wrapped tablets on a scale large enough for assessment of the effects of their provision. An experiment could be mounted by providing medicine cupboards as standard fittings in a new town or large housing estate or by dispensing drugs in a given town in child-resistant containers. It would clearly be of great value to know, for instance, whether, if lockable drug-cupboards were provided, they would be used, whether they would be effective in reducing the amount of poisoning, and whether the cost of their provision would be offset by a decrease in morbidity.

Though the prevention of poisoning is the major problem, the management of the poisoned child can occasionally be difficult. The establishment of regional and national poisons information centres has been of immense help to the clinician. Expert advice is immediately available, and the rapid identification of the poison taken and of its toxicological properties can be of great value. Nevertheless, difficulties in management can arise even when the drug is known. Recently a child was admitted unconscious to the Royal Victoria Infirmary, Newcastle upon Tyne, after having taken a certain known drug, but the manufacturers were unable to tell us whether the drug could be eliminated by dialysis. The thorny problem of the identification of drugs remains. In spite of continued exhortations and recommendations from the medical profession the pharmaceutical industry has been reluctant to code or mark tablets so that they are readily identifiable; some pharmacists are even reluctant to honour the suffix N.P. (nomen proprium). In this respect we note with pleasure that many hopitals have the letters N.P. already printed on outpatient prescriptions. We firmly believe that all drugs dispensed should be labelled by name unless the pharmacist is specifically instructed to the contrary.

We are grateful to the many doctors in the Accident and Emergency Departments and in the Children's Wards of the Royal Victoria Infirmary, Newcastle upon Tyne, the Newcastle General Hospital, and the Queen Elizabeth Hospital, Gateshead, for their help and co-operation in this study.

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Poisons Information Service: Fourth Annual Report for the Year Ended 31 December 1967

The three previous annual reports of the Poisons Information Service have been printed in the "Monthly Bulletin of the Ministry of Health." This has now ceased publication, and the fourth annual report is printed below. Requests for reprints should be sent to the Poisons Reference Service, New Cross Hospital, Avonley Road, London S.E.14.

The last report on this Service appeared in the Monthly Bulletin of the Ministry of Health in August 1967. It covered the 12 months ended 31 December 1966. During that period 5,006 inquiries were dealt with at the four centres in London, Edinburgh, Cardiff, and Belfast. Over the 12 months ended 31 December 1967 the total rose to 7,227, though this included 869 in Dublin, which was not fully operational during the previous year. Clearly the increased load was substantial overall, and it applied particularly to Cardiff and Edinburgh and still more to London (Table I). This does not necessarily reflect any wider incidence of poisoning in the country as a whole, but it does indicate that the Service is meeting progressively greater demands.

TABLE I .- Inquiries Answered

	Plants	Drugs	House- hold	Agri- culture	Industry	Miscel- laneous	Total	
Belfast Cardiff Dublin Edinburgh London	274	170 152 428 436 2,131	181 141 285 281 1,597	20 7 43 37 275	9 23 38 42 221	0 4 37 6 174	390 356 869 840 4,772	

	TABLE II.—Number of Children and Adults								
		Children	Adults	Unknown	Total				
Belfast Cardiff Dublin Edinburgh London		305 237 572 574 2,942	95 119 183 319 1,537	6 0 114 32 302	406 356 869 925 4,781				

Once again the majority of inquiries concerned drugs and medicines, with household products a close second. Children, too, were preponderantly involved in a ratio of about 2:1 (Table II). Doctors continued to be most helpful in responding to "follow-ups," about 70% on an average providing the sought-for details concerning the course and outcome of each incident. The extent to which reminders can yield a better return under this heading is illustrated by the figure of 60% for London, where no more than one approach is ever made,

by comparison with 90% for Edinburgh, where reminding is the rule. The time has come, nevertheless, to question—in London at least—the value of persisting with this intensive "follow-up" exercise. To send out between 150 and 200 letters a week, and to collect and evaluate the returns, is an enormous task. Over the past few years this effort has yielded invaluable information, unique in its form and indispensable in revising the reference index. But whether the continuing effort and expense are still justified by results seems doubtful. In future, London may adopt a more selective and discriminating "follow-up" practice.

The proportion of fatalities in 1967 remained about the same as hitherto, drugs and medicines being as usual the chief offenders, with the hypnotics, tranquillizers, and antidepressants well to the fore. Out of the total of 7,227 inquiries dealt with by the Service, 77 were known to have had a fatal outcome, 45 of them from drugs. Most of these incidents were of self-poisoning in adults. Though certain of these drugs may have transformed the therapeutic outlook in psychological medicine, there is no doubt that, when prescribed as they commonly are for patients with depression, they afford a very convenient method of self-destruction.

A few other cases may be of interest. A child died after swallowing inadvertently a few millilitres of oil of wintergreen (methyl salicylate). The severe toxicity of this substance is often overlooked. Another child of 2 took little more than a mouthful of camphorated oil and went into coma, with muscular twitchings and dyspnoea, though he revived with conservative treatment after an anxious few hours. A fatal case in an adult was unusual in that the substance responsible was a herbal purgative, but it contained a significant amount of colchicine. Another extraordinary incident concerned the drug phencyclidine, at one time used in anaesthetic practice but then abandoned because it gave rise to schizophrenic-like side-effects. Two men "procured" and ate a chicken which happened to have been treated with this substance experimentally. Both developed marked mental symptoms, though the outcome was eventually favourable.